Phonotaxis of Male Meadow Grasshoppers (Orthoptera: Tettigoniidae)

Glenn K. Morris

Department of Zoology, Erindale College,
University of Toronto, Toronto, Canada.

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Abstract: Phonotaxis occurs in males of two *Orchelimum* species. Conspecific male song transmitted by a speaker elicited rapid direct approach over distances up to 2 meters. Certain individuals responded repeatedly as the speaker was relocated, the latency of their response decreasing in successive trials. This taxis is interpreted as the approach phase of male aggression.

The present paper documents a taxic response by males of *Orchelimum gladiator* Bruner and *O. vulgare* Harris to a purely acoustical stimulus.

A speaker (ionophone) was used to expose males to the relayed or tape-recorded song of male conspecifics. The relay technique required a caged male located at least 15 meters from the study area. A microphone and amplifier system conveyed this male's song to the speaker. The sound level was crudely matched to the level typically produced by the species by adjusting the speaker output to give identical deflections of a recording level meter for identical microphone to insect and microphone to speaker distances.

Several sound systems were employed at various times, all of which distorted the normal carrier frequency of the song by attenuating or removing frequencies above 18 kHz. Since the principal peaks in the spectra of both species lie below this frequency, the speaker output was considered a reasonable model of the real signal.

Trials were conducted in typical meadow habitat of waist-high sedge and grass where staked grids aided in mapping displacements. The timing of events was derived from a tape-recorded description. Males were usually released in study areas several hours in advance. The speaker horn was placed at a distance of 0.5 to 2 m. from a male and directed toward him. Males tested were at least 3 m. from any other conspecific.

Disturbance, in the form of a stereotyped hiding behavior, usually coincided with the placing of the speaker. Singing stopped and the animal pivoted quickly, putting the perch between itself and the source of the disturbance. Jumping legs were fully extended posteriorly and the ventral body surface pressed against the sedge or grass perch. The insect remained rigidly motionless for as much as 1

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minute and then renewed its song. After several song sequences the speaker was turned on and a trial begun.

Orchelimum singers do not move more than a few centimeters an hour. Locomotory response toward the speaker signal was thus a striking behavioral change. It consisted of 15 to 60 cm leaps alternating with periods of walking and occasional pauses accompanied by singing. The advance was only slightly affected by the abundance and position of the intervening vegetation. The insect usually arrived within 10 to 20 cm of the speaker after 1 to 2 minutes. Frequent height changes might occur during the approach but horizontal displacement was always markedly direct. Individuals sometimes began their movement with a single long jump directly at the speaker.

Approximately 15 to 20% of the individuals tested made at least one approach. Ten *O. gladiator* males responded a total of 25 times; 10 *O. vulgare* males responded 16 times. Two meters was the maximum speaker to male distance over which a phonotaxis was observed.

The latency of the approach response is the time from the onset of speaker stimulus till the insect begins its horizontal movement. The mean latency for the initial approaches of 8 *O. vulgare* males was 1 minute 26 sec. Responding males were often tested again by repositioning the speaker. The horn was placed to offer a new approach direction differing from the old by as much as 180°. Males usually remained responsive through several such trials in succession with a decreasing threshold of response. In a typical result one male showed successive latencies of 4, 2 and 1 minutes.

Males of these species interact aggressively with conspecifics (Morris, 1967 and 1971). This behavior involves the approach of one male to another and often results in grappling physical contact. The speaker song is presumably eliciting this same aggressive approach.

The aggressive nature of the phonotaxis is suggested by the actions of a male *O. vulgare* which encountered a newly-killed male conspecific on arrival at the speaker horn. The dead insect had been glued to a dowel in a natural pose and placed beside the speaker. As the speaker signal continued, the advancing male walked along the dowel and touched the corps with his antennae. He directed bites to its head region and climbed on top of the dead male. A similar response was obtained when an *O. gladiator* male made a phonotaxic approach under the same conditions.

It is commonly assumed that the function of male song in katydids is to attract and guide the female. For these two species the male song also stimulates aggressive behavior and guides its initial approach phase.

Literature Cited

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